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STEERING COLUMN ASSEMBLY HAVING CLAMPING MECHANISM

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The subject invention relates to an adjustable steering column for a vehicle and having telescoping components to adjust a height position of a steering wheel to accommodate the position of a driver.

2. Description of the Prior Art

[0002] Contemporary automobiles include a steering column to adjust a height position of a steering wheel connected to the vehicle steering column to accommodate the position of a driver. A typical telescoping steering column assembly includes one bracket fixed to the frame of a vehicle and another bracket in telescoping relationship with the first bracket to provide relative longitudinal movement between the two brackets. These brackets, engaged one within another in a telescoping fashion, allow the driver to push or pull the steering wheel to a desired position and then to lock the brackets in the telescoping column against telescoping movement relative to one another.

[0003] The art is replete with various designs of steering column assemblies with locking devices for releasably adjusting and securing the telescoping steering column to accommodate the position of a driver. The United States Patent No. 6,276,719 to Gartner; the French Patent No. FR 2787842 to Chartrain et al.; and the European Patent No. EP 0443881 to Kinoshita disclose various designs of a clamping and locking device for a steering column assembly utilized to releasably adjust and secure the steering column to accommodate the position of a driver.

[0004] The United States Patent No. 6,276,719 to Gartner teaches a locking device for releasably securing an adjustable steering column to a motor-vehicle body. The locking device comprises two locking elements where one of the two locking elements is attached to the steering column and the other is attached the motor-vehicle body. The two locking elements are adjustable in relation to each other between a release position, which allows

the steering column to be adjusted, and a locking position, which secures the steering column against adjustment. One of the two locking elements is designed as an elastically ductile deformation element that can be deformed in the locking position by means of the other locking element.

[0005] The French patent No. FR 2787842 to Chartrain et al. teaches a vehicle steering column clamp moved to a clamping position by a cam rotatable about axis extending through the clamp. The European Patent No. EP 0443881 to Kinoshita teaches a tilting steering column employing a caming device with a resilient member between two cam members. A tilt lever is mounted on the bolt to operate the first and second cam members to retain and release the frictional clamping engagement. The resilient member is provided between the first and second cam members to provide a positive lock during steering column tilting operation.

[0006] There remains a constant need in improving steering column assembly design that includes a clamping mechanism for releasably adjusting and securing the steering column assembly and to provide a positive lock.

BRIEF SUMMARY OF INVENTION

[0007] A steering column assembly of the present invention includes a compression bracket for attachment to a vehicle body. An adjustable steering column assembly is movably supported by the compression bracket for longitudinal adjustment along a longitudinal axis between adjusted positions. A pair of locking elements are operably connected to the compression bracket and movable between a locked position for preventing longitudinal movement of the adjustable steering column assembly relative to the compression bracket and a release position for allowing longitudinal movement of the adjustable steering column assembly along longitudinal axis. The first element of the steering column assembly presents a detent recess. The second element of the steering column assembly is movable between the locked position engaging the detent recess and the release position out of engagement with the detent recess.

[0008] An advantage of the present design is to provide a steering column assembly that

includes a clamping mechanism for releasably adjusting and locking brackets of the steering column assembly one with the other to accommodate the position of the driver and to provide a positive lock between the brackets.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0010] Figure 1 is an exploded perspective view of a steering column assembly having a clamping mechanism including a bracket device having rollers connected thereto and rotatably engaged within a wedge defining a detent recess;

[0011] Figure 2 is a perspective view of the top of the steering column assembly having the clamping mechanism;

[0012] Figure 3 is another perspective view of the bottom of the steering column assembly having the clamping mechanism;

[0013] Figure 4 is a bottom view of the steering column assembly having the clamping mechanism;

[0014] Figure 5 is a fragmental view of the bracket device having the rollers connected thereto and rotatably engaged within the detent recess defined in the wedge; and

[0015] Figure 6 is a cross sectional view of the bracket device engaged with the wedge shown in Figure 5.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Referring to the Figures 1 through 6, wherein like numerals indicate parts throughout the several views, a steering column assembly of the present invention is generally shown at **10.**

[0017] The steering column assembly **10** of the present invention includes a compression bracket, generally shown at **12,** for attachment to a vehicle body. An adjustable steering column assembly, generally shown at **14,** is movably supported by the compression bracket **12** for longitudinal adjustment along a longitudinal axis **A** for movement between

adjusted positions. A pair of locking elements, generally indicated at **16, 18**, respectively, are operably connected to the compression bracket **12** and movable between a locked position for preventing longitudinal movement of the adjustable steering column assembly **14** relative to the compression bracket **12** and a release position for allowing longitudinal movement of the adjustable steering column assembly **14** along the axis **A**.

[0018] The first element **16** of the steering column assembly **10** presents a detent recess **20**. The second element **18** of the steering column assembly **10** is movable between the locked position engaging the detent recess **20** and the release position out of engagement with the detent recess **20**.

[0019] The compression bracket **12** includes a top wall **22** extending between first **24** and second **26** ends. The compression bracket **12** includes bracket sections **28, 30** interconnected by a wall **31**, as shown in Figure 3. The bracket sections **28, 30** are disposed on opposite sides of the column assembly **10**. The bracket sections **28, 30** include an integral ridge **29** (only one is shown in Figure 1) defined therein to divide the bracket sections **28, 30** into top and bottom portions, with the bottom portions being closer together than the top portions. The bracket sections **28, 30** include a bottom lip **32** that is integral with and extends inwardly from the lower extrimity of each bracket section **28, 30** parallel to the top wall **22** and the wall **31**, i.e., the lips **32** extend toward one another. The top wall **22** and the wall **31** are sandwiched one with the other and welded together.

[0020] A flange **34** that extends outwardly and horizontally from each side of the top wall **22**. The compression bracket **12** includes a plurality of reinforcing ribs **35**, integral with and extending between the top wall **22** and the flange **34**. The compression bracket **12** also includes a plurality of reinforcing ribs **37**, integral with and extending between the bracket sections **28, 30** and the wall **31**. The compression bracket **12** includes a reinforcing web **36** integral with and extending between the top portion of the bracket sections **28, 30** and flanges **34** at the second end **22** of the compression bracket **12.** The flanges **34** of the compression bracket **12** includes an aperture **38** for receiving a fastener (not shown) for connecting the compression bracket **12** to the body of the vehicle. The bracket sections **28, 30** further include holes **39, 40** extending therethrough. The

compression bracket **12** includes a flange **42** extending outwardly from the bracket sections **28, 30** at the first **24** and second **26** ends. The compression bracket **12** includes a support member **41** spaced from the top wall **22** and is designed for attachment to the body of the vehicle for supporting the adjustable steering column **14.** The compression bracket **12** and the support member **41** are formed from a polymer by extruding the polymer through injection molding. The compression bracket **12** and the support member **41** may be formed from a metal. Those skilled in the art will appreciate that the steering column assembly **10** of the present invention may include an alternative embodiment (not shown) wherein the flanges **34** are designed to adaptably engage a release mechanism for an energy absorption device (not shown) as described in the U.S. Patent No. 6,419,269 to Manwaring et al.

[0021] As best shown in Figures 1 and 2, the first locking element **16** is defined by a wedge, generally indicated at **44**. The wedge **44** includes front **46** and rear **48** ends, first **50** and second **52** side surfaces. The wedge **44** is connected to the bracket section **28** of the compression bracket **12** at the first side surface **50** of the wedge **44.** The second side surface **52** of the wedge **44** is sloping with respect to the longitudinal axis **A** defining an acute angle therebetween. The wedge **44** includes an inclined ramp **56** sloping from the rear end **48** and further extends downwardly and then upwardly to define the detent recess **20** and then extends to the front end **46** to define a wall **58** extending in parallel relationship with respect to the longitudinal axis **A**.

[0022] Referring back to Figures 1 through 3, the adjustable steering column assembly **14** includes a support bracket, generally indicated at **59.** The support bracket **59** has first **60** and second **62** ends, and side walls **64, 66,** parallel one the other and interconnected by a top wall **68.** The support bracket **59** further includes an elongated slot **70** extending longitudinally of the first end **60** and to the second end **62** of the support bracket **59.** Similar to the compression bracket **12,** the support bracket **59** is formed of a polymer. In another embodiment, the support bracket **59** is formed from a metal.

[0023] The adjustable steering column assembly **14** includes inner **80** and outer **82** tubular members disposed one within the other in a telescoping fashion. The outer tubular member **82** of the adjustable steering column assembly **14** is disposed within and

connected to the support bracket **59**. The inner tubular member **80** of the adjustable steering column assembly **14** is connected to the outer tubular member **82** by a pair of extruded bushings (not shown) sandwiched therebetween. Hence, the number, shape, and material of the bushings used to connect the inner **80** and outer **82** tubular members is not intended to limit the present invention. When the steering column **10** moves into dash board (not shown) during the crash, the extruded bushings are ruptured, thereby releasing the inner **80** and outer **82** tubular members from locking engagement to allow the inner **80** and outer **82** tubular members to collapse telescopingly in response to the crash condition. Similar to the support bracket **59** and the compression bracket **12,** the inner **80** and outer **82** tubular members are formed from a metal or may be extruded from a polymeric material.

[0024] As best shown in Figures 1 and 5, a shaft, i. e. compression shaft **90,** extends along an axis **B** transversely with respect to the longitudinal axis **A** and through the holes **39**, **40** of the compression bracket **12** and further through the elongated slot **70** of the support bracket **59** and through the wedge **44** connected to the bracket section **28** of the compression bracket **12**. The compression shaft **90** includes a tubular bushing **92** disposed about the compression shaft **90** and between the side walls **64, 66** of the support bracket **59** to hold the side walls **64, 66** in a fixed position and prevent the side walls **64, 66** from bending. The terminal end **94** of the compression shaft **90** is secureably connected within the bracket section **30** of the compression bracket **12** by a nut **96.** The other terminal end **98** extends freely beyond the bracket section **28** of the compression bracket **12** and the wedge **44** and is not connected therewithin.

[0025] The steering column assembly **10** includes a bracket device, i.e. carriage **100.** The bracket device **100** includes a generally tubular configuration and is disposed about the terminal end **98** of the compression shaft **90.** The bracket device **100** has sides **102, 104** interconnected by a top wall **106.** The bracket device **100** includes a roller **108** rotatably connected to each side **102, 104** of the bracket device **100.** The bracket device **100** includes a roller pins **109** extending through each roller **108** and the sides **102, 104** to facilitate the rotational movement of the rollers **108** about the roller pins **109.** The bracket device **100** includes a pin **110** extending through the bracket device **100** and the

compression shaft **90** along a detent axis **C** extending vertically with respect to the longitudinal axis **A** to pivotably rotate the bracket device **100** about the compression shaft **90.**

[0026] The steering column assembly **10** includes a lever **112** attached to and extending from the top wall **106** of the bracket device **100.** The release lever **112** includes a shoulder **114** at one terminal end and a gripper **116** at another terminal end. The shoulder **114** is connected to the bracket device **100.** The steering column assembly **10** includes an alternative embodiment, wherein the lever **112** is actuated electrically by means of a solenoid (not shown), or the like.

[0027] In operation, as the lever **112** is pivotably rotated about the detent axis **C** to the longitudinal axis **A**. The rollers **108** are rotated about the roller pins **109** engaged in the bracket device **100**. The rollers **108** roll over the inclined ramp **56** into the detent recess **20** to lock within the detent recess **20,** whereby the first **16** and second **18** locking elements interconnect and move the bracket sections **28, 30** into clamping engagement with the adjustable steering column assembly **14** for preventing relative longitudinal movement between the compression bracket **12** and the support bracket **59.** When the lever **112** is pivotably rotated away from the longitudinal axis **A**, the rollers **108** are forced out of the detent recess **20** to allow relative longitudinal movement between the support bracket **12** and the support bracket **59,** with respect to one another to adjust a height position of a steering wheel (not shown) connected to the telescoping steering column assembly **10** to accommodate the position of a driver.

[0028] While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.